Abstract

CdSe flower-like nanorods (NRs) were successfully synthesized by Sol–gel technique where a simple aqueous technique was applied. The effects of different selenium (Se) concentration in the precursor solution on the material properties were studied. The X-ray diffraction (XRD) analyses show that a cubic zinc blende crystal structure was formed. Variation in the crystallite sizes were observed for different amounts of Se used in the precursor. The sizes estimated from various techniques were in the range 3–5 nm. The XRD peak intensity reached an optimum when 8 mL of 0.5 M of reduced selenium was used. The surface topography obtained from the scanning electron microscope showed densely packed and uniformly distributed flower-like rod/blade-like shaped CdSe NRs. The Fourier transform infrared spectrophotometer gave the stretching vibrations of the CdSe NRs with some bands belonging to the capping agent and the solvent. Thermal analysis conducted portrayed the 8 mL sample to be more stable than other samples at various temperatures. The photoluminescence (PL) studies displayed a red shift in the emission peaks (550–575 nm) as the selenium concentration was increased from 4 to 12 mL. This was then followed by an increase in the PL peak intensity which reached a maximum at 8 mL of Se used during the synthesis. The band gap energies calculated from the absorption spectra decreased from 3.27 to 2.79 eV with an increase in the Se concentration. The percentage transmittance of CdSe NRs varied with different amounts of Se in the precursor solution.